

PATENT APPLICATION
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re patent application of: Robert C. Knauerhase, Vijay Tewari, Scott H. Robinson, Mic Bowman and Milan Milenkovic

Serial No. 10/754,098 Examiner: Michael C. LAI

Filed: January 2, 2004 Group Art Unit: 2157

For: DYNAMIC VIRTUAL MACHINE SERVICE PROVIDER
ALLOCATION

Confirmation No. 6512

Mail Stop AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

AMENDMENT

Responsive to the Office Action dated July 24, 2008, please amend the application as follows:

AMENDMENTS TO THE CLAIMS are reflected in the listing of claims which begins on page 2 of this paper.

REMARKS/ARGUMENTS begin on page 9 of this paper.

IN THE CLAIMS

Please amend the claims to read as follows:

1. (Previously Presented) A service apparatus implemented in a machine, comprising:

a service request receiver to receive a request for a first service;

a storage;

a set of virtual machines stored in the storage, each virtual machine to implement a service;

a service manager to manage the set of virtual machines and to select a first virtual machine from a plurality of virtual machines offering the first service responsive to the request; and

a transmitter to return an access to the first virtual machine in the set of virtual machines as a response to the request for the first service.

2. (Original) A service apparatus according to claim 1, wherein:

the service apparatus further comprises:

a database of service provider data; and

an image constructor to use the database to construct an image; and

the service manager is operative to install the image as the first virtual machine in the set of virtual machines.

3. (Original) A service apparatus according to claim 1, wherein:

the service apparatus further comprises a database of images; and

the service manager is operative to install a first image from the database of images as the first virtual machine in the set of virtual machines.

4. (Original) A service apparatus according to claim 1, further comprising an archiver to archive the virtual machine.

5. (Original) A service apparatus according to claim 1, further comprising a deleter to delete the virtual machine.

6. (Original) A service apparatus according to claim 1, the service manager including a table stored in the storage, the table to indicate a state for each virtual machine in the set of virtual machines.

7. (Original) A service apparatus according to claim 1, further comprising a list of services offered by the service apparatus, the list of services to include at least the services offered by each virtual machine in the set of virtual machines.

8. (Original) A service apparatus according to claim 1, wherein at least one of the virtual machines implements the service and a second service.

9. (Previously Presented) A system, comprising:
a network;
a service request receiver to receive a request for a first service;
a list of services offered;
a service manager to manage a set of virtual machines and to select a first virtual machine from a plurality of virtual machines offering the first service responsive to the request; and
a transmitter to return an access to the first virtual machine in the set of virtual machines as a response to the request for the first service.

10. (Original) A system according to claim 9, further comprising a client machine coupled to the network, the client computer to send the request.

11. (Previously Presented) A system according to claim 9, further comprising at least one server farm machine, each server farm machine including:
a storage; and
at least one virtual machine from the set of virtual machines, stored in the storage of the server farm machine, each virtual machine to implement a service.

12. (Original) A system according to claim 9, further comprising a list of services offered by the system, the list of services to include at least the services offered by each virtual machine in the set of virtual machines.

13. (Original) A system according to claim 9, further comprising a service apparatus, the service apparatus to include the service request receiver, the service manager, and the transmitter.

14. (Previously Presented) A system according to claim 9, further comprising:

a service apparatus, the service apparatus to include the service request receiver and the transmitter;

at least one server farm machine, each server farm machine to include:

a storage; and

at least one virtual machine from the set of virtual machines, stored in the storage of the server farm machine, each virtual machine to implement a service; and a management machine, the management machine to include the service manager.

15. (Original) A system according to claim 9, wherein at least one of the virtual machines in the set of virtual machines implements a first service and a second service.

16. (Previously Presented) A method, comprising:

receiving a request for a service;

accessing a list of services offered by a set of virtual machines;

determining if the requested service is in the list of services; and

if the requested service is in the list of services:

determining a plurality of virtual machines offering the requested service;

selecting one of the plurality of virtual machines; and

returning an identifier for the selected virtual machine offering the requested service.

17. (Original) A method according to claim 16, further comprising, if the requested service is not in the list of services:

creating an image for a new virtual machine that offers the requested service;

installing the image for the new virtual machine; and

returning an identifier for the new virtual machine.

18. (Original) A method according to claim 17, further comprising adding the requested service to the list of services.

19. (Original) A method according to claim 18, wherein adding the requested service includes identifying the new virtual machine in the list of services as offering the requested service.

20. (Original) A method according to claim 17, wherein installing the image includes:

selecting one of a set of machines to support the new virtual machine; and
installing the image for the new virtual machine in the selected machine.

21. (Original) A method according to claim 20, wherein selecting one of a set of machines includes selecting the selected machine to balance loads on the machines in the set of machines.

22. (Original) A method according to claim 17, wherein creating an image includes selecting a combination of software packages that define the new virtual machine to offer the requested service.

23. (Original) A method according to claim 17, wherein creating an image includes copying the image for the new virtual machine from a set of pre-constructed images.

24. (Original) A method according to claim 16, wherein:

determining the virtual machine offering the requested service includes:

determining that a new virtual machine should offer the requested service;
creating an image for the new virtual machine; and
installing the image for the new virtual machine;

returning an identifier for the virtual machine includes returning an identifier for the new virtual machine.

25. (Canceled)

26. (Original) A method according to claim 16, wherein determining the virtual machine includes:

determining if the virtual machine is active, sleeping, or archived; and if the requested machine is sleeping or archived, activating the virtual machine.

27. (Previously Presented) An article, comprising:
a storage medium, said storage medium having stored thereon instructions, that, when executed by a machine, result in:

receiving a request for a service;

accessing a list of services offered by a set of virtual machines;

determining if the requested service is in the list of services; and

if the requested service is in the list of services:

determining a plurality of virtual machines offering the requested service;

selecting one of the plurality of virtual machines; and

returning an identifier for the selected virtual machine offering the requested service.

28. (Original) An article according to claim 27, the storage medium further including instructions, that when executed by the machine, result in, if the requested service is not in the list of services:

creating an image for a new virtual machine that offers the requested service;

installing the image for the new virtual machine; and

returning an identifier for the new virtual machine.

29. (Original) An article according to claim 28, the storage medium further including instructions, that when executed by the machine, result in, adding the requested service to the list of services.

30. (Original) An article according to claim 29, wherein adding the requested service includes identifying the new virtual machine in the list of services as offering the requested service.

31. (Original) An article according to claim 28, wherein installing the image includes:

selecting one of a set of machines to support the new virtual machine; and
installing the image for the new virtual machine in the selected machine.

32. (Original) An article according to claim 31, wherein selecting one of a set of machines includes selecting the selected machine to balance loads on the machines in the set of machines.

33. (Original) An article according to claim 28, wherein creating an image includes selecting a combination of software packages that define the new virtual machine to offer the requested service.

34. (Original) An article according to claim 28, wherein creating an image includes copying the image for the new virtual machine from a set of pre-constructed images.

35. (Original) An article according to claim 27, wherein:
determining the virtual machine offering the requested service includes:

determining that a new virtual machine should offer the requested service;
creating an image for the new virtual machine; and
installing the image for the new virtual machine;

returning an identifier for the virtual machine includes returning an identifier for the new virtual machine.

36. (Canceled)

37. (Original) An article according to claim 27, wherein determining the virtual machine includes:

determining if the virtual machine is active, sleeping, or archived; and
if the requested machine is sleeping or archived, activating the virtual machine.

38. (New) A service apparatus according to claim 8, wherein the first virtual machine does not implement the second service.

39. (New) A system according to claim 15, wherein the first virtual machine does not implement the second service.

40. (New) A method according to claim 16, wherein:

accessing a list of services offered by a set of virtual machines includes accessing the list of services offered by the set of virtual machines, the list of services including at least the requested service and a second service; and

selecting one of the plurality of virtual machines includes selecting the one of the plurality of virtual machines offering the requested service and not offering the second service.

41. (New) An article according to claim 27, wherein:

accessing a list of services offered by a set of virtual machines includes accessing the list of services offered by the set of virtual machines, the list of services including at least the requested service and a second service; and

selecting one of the plurality of virtual machines includes selecting the one of the plurality of virtual machines offering the requested service and not offering the second service.

REMARKS

Claims 1-24, 26-35, and 37 are pending. Claims 1-3, 5-16, and 27 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,063,500 to Shorter. Claims 4, 26 and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,063,500 to Shorter. Claims 17, 20-24, 28, and 31-35 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,063,500 to Shorter in view of U.S. Patent No. 6,704,764 to Ottati and further in view of U.S. Patent Publication No. 2005/0060704 to Bulson et al. Claims 18-19 and 29-30 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,063,500 to Shorter in view of U.S. Patent No. 6,704,764 to Ottati in view of U.S. Patent Publication No. 2005/0060704 to Bulson et al. and further in view of U.S. Published Patent Application No. 2002/0013827 to Edstrom et al.

Reconsideration is requested. The rejections are traversed. No new matter is added. Claims 38-41 are added. Claims 1-24, 26-35, and 37-41 remain in the case for consideration.

The Applicant would like to remind the Examiner that in the Office Action dated January 24, 2008, the Examiner had indicated that claims 25 and 36, among others, were indicated as allowable if rewritten in independent form. Claims 16 and 27 were amended to include the features of claims 25 and 36, respectively; claims 1 and 9 were amended to recite similar features. Thus, the Applicant believes independent claims 1, 9, 16, and 27 all recite features not taught or suggested by Shorter, and are therefore allowable without further discussion. As the Examiner now rejects claims 1, 9, 16, and 27 as anticipated by Shorter, the Applicant respectfully requests that the Examiner explain why the Examiner has changed his mind regarding the allowability of the features of former claims 25 and 36 over Shorter.

REJECTIONS UNDER 35 U.S.C. § 102(b)

Shorter teaches a system for executing segments of a program concurrently on virtual machines. Shorter creates a pool of virtual machines, and assigns a request from the program to an “idle run ready virtual machine” (*see, e.g.* Shorter, Abstract, line 12). To avoid assigning requests to different virtual machines that require sequential processing, Shorter assigns requests that have the same process ID (PRID) and thread ID (THRID) information to the same virtual machine (*see* Shorter, column 5, lines 49-51); requests with different PRIDs or THRIDs are assigned to different virtual machines (*see* Shorter, column 5, lines 51-61).

In rejecting claims 1, 9, 16, and 27, the Examiner argues that Shorter teaches a set of virtual machines, each virtual machine to implement a service, and a service manager to select a virtual machine from a plurality of virtual machines offering the requested service (see Office Action dated July 24, 2008, pages 3, 5, and 7-8). The Applicant respectfully disagrees.

Shorter does not teach virtual machines implementing services

The Examiner argues that Shorter teaches each virtual machine implements a service at figures 5, 6A, and 6B and at column 11, lines 9-18. Shorter never describes figure 5 directly, but figure 5 merely shows a number of virtual machines 50 being managed by a virtual machine pool manager 46, which is interacting with two user programs. Of the 5 virtual machines shown in figure 5 of Shorter, the first four machines are operating on behalf of the two user programs; the fifth virtual machine is idle.

Figures 6A and 6B of Shorter show the data structure used by the virtual machine pool manager, to track which virtual machines are working on requests for user programs, and the PRIDs and the THRIDs of the requests being handled by the virtual machines. Nowhere does this teach, let alone suggest, that the virtual machines of Shorter implement particular services.

Column 11, lines 9-18 of Shorter describes the creation of the virtual machines. According to Shorter, “the VMPM 46 will create an entry in a VMPM data structure 56 shown in FIG. 6A representing that virtual machine and its state, in control blocks that are owned by the VM pool manager 46. When all virtual machines 50 in the list have been created, the VMPM will return control to the AVS” (see Shorter, column 11, lines 10-15). Shorter makes no mention of the virtual machines implementing services.

According to Shorter, the virtual machines are created using the Autolog macro. Shorter states that “[t]he Autolog macro is a known function in the VM operating system. When issued for a particular named virtual machine 50, it will result in that machine being created and placed in a state such that it is waiting for work” (see Shorter, column 10, lines 54-58). If the only factor considered in the creation of the virtual machine is the ID of the virtual machine (see Shorter, column 10, lines 50-53), and the Autolog macro makes no mention of particular services being assigned to particular virtual machines, then all virtual machines are identical, except for their IDs.

In fact, nowhere does Shorter mention that the different virtual machines are to implement services. The Examiner might be arguing that this concept is inherent in Shorter, if any virtual machine is capable of responding to any request. But if this argument were true, then Shorter cannot teach different virtual machines implement different services. Accordingly, new claims 38-41 would therefore be patentable under 35 U.S.C. § 102(b) (and 35 U.S.C. § 103) over Shorter: Shorter would not only not teach the features of these claims, but would in fact teach away from the features of these claims. In addition, if each virtual machine in Shorter were capable of offering any service, then Shorter would not teach accessing a list of services offered by the virtual machines, as recited in claims 16 and 27 (if any virtual machine in Shorter can respond to any request, then there is no need to access a list of services, to determine which virtual machines offer the requested service).

Shorter does not teach select a virtual machine from a plurality of virtual machines offering the requested service

In the Office Action dated July 24, 2008, the Examiner argues that Shorter teaches selecting a virtual machine from a plurality of virtual machines offering the requested service (see Office Action dated July 24, 2008, pages 3, 5, and 7-8). As argued above, Shorter does not teach virtual machines offering particular services. Accordingly, Shorter is not selecting a virtual machine based on its ability to offer a particular service; Shorter is selecting a virtual machine based solely on whether it is idle or not (assuming, of course, that Shorter is not selecting an already-in-use virtual machine because the new request has the same PRID and THRID as an earlier request already in progress).

In addition, claims 1, 9, 16, and 27 were amended to recite this feature in response to the previous Office Action. In the Office Action dated January 24, 2008, the Examiner had indicated that claims 19-25 and 30-36 were allowable if rewritten in independent form. The feature added to claims 1, 9, 16, and 27 was previously found in original claims 25 and 36 (now canceled). Inherent in the Examiner's statement that claims 19-25 and 30-36 were allowable if rewritten in independent form is an acknowledgement that the features of these claims are not found in any reference already of record in this application. As the Examiner had rejected claims 1-3, 5-16, and 27 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,063,500 to Shorter in the Office Action dated January 24, 2008, the Examiner had implicitly acknowledged that the features of claims 19-25 and 30-36 (and, in particular, the features of claims 25 and 36) were not taught or suggested by Shorter. The Applicant

respectfully requests the Examiner to explain why claims 1, 9, 16, and 27 are rejected as anticipated by Shorter, given the previous acknowledgement that claims 25 and 36 were not anticipated by Shorter.

As Shorter does not teach or suggest virtual machines to implement services or a service manager to select a virtual machine from a plurality of virtual machines offering the first service, claims 1, 9, 16, and 27 are patentable under 35 U.S.C. § 102(b) over Shorter. Accordingly, claims 1, 9, 16, and 27 are allowable, as are dependent claims 2-8, 10-15, 17-24, 26, 28-35, and 37-41.

In rejecting claim 2, the Examiner argues that Shorter teaches a database of service provider data, citing to figures 5, 6A, and 6B, and to column 11, lines 9-18 of Shorter. These portions of Shorter have already been discussed, and do not teach or suggest a database of service provider data. Further, as argued above, in Shorter all the virtual machines are identical. Accordingly, Shorter does not teach or suggest creating an image based on the database of service provider data. Therefore, claim 2 is patentable under 35 U.S.C. § 102(b) over Shorter.

In rejecting claims 7 and 12, the Examiner argues that “[a] list of virtual machine[s] is equivalent to a list of service[s]” (*see* Office Action dated July 24, 2008, pages 5-6). This is an incorrect statement. If this statement were correct, then from the list of virtual machines one would be able to identify the services the virtual machines offer. The only way this could occur is if each virtual machine offers one (and only one) service, each virtual machine offers a unique service, and there was a mapping from the service to the corresponding virtual machine. Only if these three conditions are met might the list of virtual machines be equivalent to the list of the services the virtual machines offer. But even in this specific circumstance, there is still a list of services: it maps the services to the virtual machines offering the service.

It might be possible to omit the mapping from the services to the virtual machines, if it was known somewhere else which service each virtual machine offered: for example, from the ID of the virtual machine. (In fact, even then there is still a list of services; but it might be implicitly stored somewhere, rather than explicitly managed. There is also the potential problem that the ID of the virtual machine might not accurately reflect the service that virtual

machine offers, but let us ignore this potential problem.) But the other conditions cannot be omitted without losing the Examiner's argued equivalence. If multiple machines offer the same service, or if a single machine offers multiple services, the number of virtual machines differs from the number of services offered, and therefore the lists cannot be equivalent.

Even if we assume that the list of virtual machines can be equivalent to the list of services offered by those virtual machines (based on the conditions above), there is still a problem: in Shorter, all the virtual machines are identical (as argued above). But if the virtual machines of Shorter are all identical, then at least one of the two conditions is violated. This means that the list of virtual machines in Shorter cannot be equivalent to the list of services offered by those virtual machines. And if these lists are not equivalent, then the Examiner's argument is incorrect.

As Shorter does not teach or suggest a list of services offered by each virtual machine, claims 7 and 12 are patentable under 35 U.S.C. § 102(b) over Shorter. Accordingly, claims 7 and 12 are allowable.

In rejecting claims 8 and 15, the Examiner argues that Shorter teaches VM01 implementing both the MAIL and DIRECTORY services at column 12, lines 59-65 (*see* Office Action dated July 24, 2008, pages 4-5 and 7). But the MAIL and DIRECTORY references are not services offered by the virtual machines: they are the applications (that is, the user programs), for which something is being assigned to the virtual machine. In fact, nowhere does Shorter teach or suggest that virtual machines offer multiple services. Accordingly, claims 8 and 15 are patentable under 35 U.S.C. § 102(b) over Shorter, and are therefore allowable, as are dependent claims 38-39.

REJECTIONS UNDER 35 U.S.C. § 103(a)

In rejecting claims 17, 24, 28, and 35, the Examiner acknowledges that Shorter does not teach creating an image for a new virtual machine that offers the requested service and installing the image for the new virtual machine (*see* Office Action dated July 24, 2008, page 10). The Examiner argues that Ottati teaches this feature, and that Bulson teaches returning an identifier of the virtual machine. The Applicant believes that neither Ottati nor Bulson teach any features of the claimed invention beyond those for which the Examiner cites to these references.

The Applicant respectfully points out that under M.P.E.P. § 2143.01, “the proposed modification cannot change the principle of operation of a reference”. The Examiner’s proposed combination would change the principle of operation of Shorter, in that all virtual machines in Shorter are identical (as argued above). In addition, if all the virtual machines in Shorter are identical, then even if a virtual machine were created later, it still would not be able to offer the requested service: it would still be identical to all the other virtual machines that did not offer the service.

As the combination of Shorter, Ottati, and Bulson does not teach creating an image for a new virtual machine offering a requested service not offered by other virtual machines, claims 17, 24, 28, and 35 are patentable under 35 U.S.C. § 103(a) over Shorter in view of Ottati and Bulson. Accordingly, claims 17, 24, 28, and 35 are allowable, as are dependent claims 18-23 and 29-34.

In rejecting claims 22 and 33, the Examiner argues that it is “inherent” to select a combination of software packages that define the new virtual machine. The Applicant respectfully disagrees. Under M.P.E.P. § 2112, the Examiner “must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art” (citing *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original)). The Examiner has provided no basis whatsoever, either in fact or in reasoning: the Examiner has only argued that the claimed feature “is inherent” (see Office Action dated July 24, 2008, page 11). Thus, the Examiner has failed to make a *prima facie* case for obviousness under 35 U.S.C. § 103, and claims 22 and 33 are patentable under 35 U.S.C. § 103(a) over Shorter in view of Ottati and Bulson, and therefore are allowable.

In rejecting claims 18 and 29, the Examiner acknowledges that Shorter, Ottati, and Bulson do not teach adding the requested service to the list of services (see Office Action dated July 24, 2008, page 13). The Examiner argues that Edstrom teaches this feature. But what Edstrom teaches is a list of “subscribed-to services” (see Edstrom, ¶ 102), not a list of services offered by the virtual machines. If Edstrom’s list is to be taken to be accurately named, then Edstrom’s list identifies services to which some consumers are currently subscribed; this is not the same as a list of services offered by the set of virtual machines (some of which might not be currently in use).

In addition, in rejecting claims 7 and 12, the Examiner argued that the list of services was taught by Shorter as the list of virtual machines. Shorter does not modify this list so that it shows only the virtual machines currently in use: this list of virtual machines is independent of which machines are currently in use. If the Examiner's argument with respect to claims 7 and 12 were correct, then the list of virtual machines cannot be modified as taught by Edstrom, as the respective lists are of different natures.

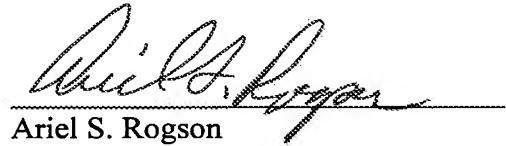
As the combination of Shorter, Ottati, Bulson, and Edstrom does not teach adding the requested service to the list of services offered by the virtual machines, claims 18 and 29 are patentable under 35 U.S.C. § 103(a) over Shorter in view of Ottati, Bulson, and Edstrom. Accordingly, claims 18 and 29 are allowable, as are dependent claims 19 and 30.

In rejecting claims 19 and 30, the Examiner argues that it is "inherent" to identify the new virtual machine as offering the requested service. The Applicant respectfully disagrees. Under M.P.E.P. § 2112, the Examiner "must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art" (citing *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original)). The Examiner has provided no basis whatsoever, either in fact or in reasoning: the Examiner has only argued that the claimed feature "is inherent" (see Office Action dated July 24, 2008, page 11). Thus, the Examiner has failed to make a *prima facie* case for obviousness under 35 U.S.C. § 103, and claims 19 and 30 are patentable under 35 U.S.C. § 103(a) over Shorter in view of Ottati, Bulson, and Edstrom, and therefore are allowable.

For the foregoing reasons, reconsideration and allowance of claims 1-24, 26-35, and 41 of the application as amended is requested. The Examiner is encouraged to telephone the undersigned at (503) 222-3613 if it appears that an interview would be helpful in advancing the case.

Respectfully submitted,

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